CLAIMS

We claim:

1. An isolated nucleic acid sequence comprising a first nucleic acid sequence selected from the group consisting of:

i. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence comprising an Ftn2 gene wherein a product encoded by the first nucleic acid sequence functions in division of a photosynthetic prokaryote or a plastid, and wherein the Ftn2 gene comprises SEQ ID NO: 1, 3, or 4;

ii. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence encoding an Ftn2 polypeptide, wherein a product encoded by the first nucleic acid sequence functions in division of a photosynthetic prokaryote or a plastid and wherein the encoded Ftn2 polypeptide comprises amino acid sequence SEQ ID NOs: 2 or 5;

iii. an Ftn2 gene, wherein the Ftn2 gene comprises SEQ ID NO: 1, 3, or 4;

iv. a nucleic acid sequence encoding an Ftn2 polypeptide, wherein the Ftn2 polypeptide comprises amino acid sequence SEQ ID NOs: 2 or 5;

v. a nucleic acid sequence comprising a mutant Ftn2 gene, wherein the mutant Ftn2 gene comprises at least one mutation and wherein the non-mutant Ftn2 gene comprises SEQ ID NO:9 or 10;

vi. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence comprising an ARC5 gene, wherein a product encoded by the first nucleic acid sequence functions in division of a photosynthetic prokaryote or a plastid and wherein the ARC5 gene comprises SEQ ID NO: 11 or 14;

vii. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence encoding an ARC5 polypeptide, wherein a product encoded by the first nucleic acid sequence functions in division of a photosynthetic prokaryote or a plastid and wherein the ARC5 polypeptide comprises SEQ ID NO:13, 16, 17, or 18;

viii. an ARC5 gene, wherein the ARC5 gene comprises SEQ ID NO: 11 or 14;

ix. a nucleic acid sequence encoding an ARC5 polypeptide, wherein the ARC5 polypeptide comprises an amino acid sequence SEQ ID NOs: 13, 16, 17, or 18;

x. a nucleic acid sequence comprising a mutant ARC5 gene, wherein the mutant ARC5 gene comprises at least one mutation and the non-mutant ARC5 gene comprises SEQ ID NO: 11 or 14;

xi. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence comprising an Fzo-like gene, and wherein a product encoded by the first nucleic acid sequence functions in division and/or morphology of a photosynthetic prokaryote or a plastid, and wherein the Fzo-like gene comprises SEQ ID NO: 19 or 22;

xii. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence encoding an Fzo-like polypeptide, wherein a product encoded by the first nucleic acid sequence functions in division of a photosynthetic prokaryote or a plastid and wherein the Fzo-like polypeptide comprises SEQ ID NO:21 or 24;

xiii. an Fzo-like gene, wherein the Fzo-like gene comprises SEQ ID NO: 19 or 22;

xiv. a nucleic acid sequence comprising a sequence encoding an Fzo-like polypeptide, wherein the Fzo-like polypeptide comprises amino acid sequence SEQ ID NO: 21 or 24

xv. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence comprising an Fzo-like gene, and wherein a product encoded by the first nucleic acid sequence functions in division and/or morphology of a photosynthetic prokaryote or a plastid, and wherein the Fzo-like gene comprises SEQ ID NO:19 or 22, and wherein the first nucleic acid sequence further comprises SEQ ID NO:25 at the 3' terminus;

xvi. a nucleic acid sequence that hybridizes under conditions of high stringency to a second nucleic acid sequence encoding an Fzo-like polypeptide, wherein a product encoded by the first nucleic acid sequence functions in division of a photosynthetic prokaryote or a plastid and wherein the Fzo-like polypeptide comprises SEQ ID NO:21 or 24, and wherein the first nucleic acid sequence further comprises SEQ ID NO:25 at the 3' terminus;

xvii. a nucleic acid sequence comprising a sequence encoding an Fzo-like polypeptide, wherein the Fzo-like polypeptide comprises amino acid sequence SEQ ID NO: 21 or 24; and

xviii. a nucleic acid sequence comprising a mutant Fzo-like gene, wherein the mutant Fzo-like gene comprises at least one mutation and the non-mutant Fzo-like gene comprises SEQ ID NO: 19 or 22.

2. An isolated nucleic acid sequence comprising an antisense sequence to the first nucleic acid sequence of Claim 1.

3. An siRNA targeted to an RNA transcribed from the first nucleic acid sequence of Claim 1.

4. The nucleic acid sequence of Claim 1 operably linked to a heterologous promoter.

5. A vector comprising the nucleic acid sequence of Claim 1.

6. A vector comprising the nucleic acid sequence of Claim 1 operably linked to a heterologous promoter.

7. An isolated protein comprising a polypeptide selected from the group consisting of:

i. an Ftn2 polypeptide comprising amino acid sequence SEQ ID NO:2 or 4;

ii. a variant of an Ftn2 polypeptide, wherein the variant is a mutant polypeptide, a truncated polypeptide, a fusion polypeptide, and/or any combination of a mutant polypeptide, a truncated polypeptide, and/or a fusion polypeptide, and wherein the non-variant Ftn2 polypeptide is SEQ ID NO;2 or 4;

iii. a variant of an Ftn2 polypeptide comprising amino acid sequence SEQ ID NO:11;

iv. an ARC5 polypeptide comprising amino acid sequence SEQ ID NO:13, 16, 17, or 18;

v. a variant of an ARC5 polypeptide, wherein the variant is a mutant polypeptide, a truncated polypeptide, a fusion polypeptide, and/or any combination of a mutant polypeptide, a truncated polypeptide, and/or a fusion polypeptide, and wherein the non-variant ARC5 polypeptide is SEQ ID NO:13, 16, 17 or 18;

vi. an Fzo-like polypeptide comprising amino acid sequence SEQ ID NO:21 or 24; and

vii. a variant of an Fzo-like polypeptide, wherein the variant is a mutant polypeptide, a truncated polypeptide, a fusion polypeptide, and/or any combination of a mutant polypeptide, a truncated polypeptide, and/or a fusion polypeptide, and wherein the non-variant Ftn2 polypeptide is SEQ ID NO:21 or 24.

8. A cell transformed with a heterologous gene comprising the nucleic acid sequence of Claim 1.

9. The cell of claim 8, wherein the organism is a plant cell or a microorganism.

10. A plant transformed with a heterologous gene comprising the nucleic acid sequence of Claim 1.

11. A plant cell transformed with a heterologous gene comprising the nucleic acid sequence of Claim 1.

12. A plant seed transformed with a heterologous gene comprising the nucleic acid sequence of Claim 1.

13. A cell transformed with a heterologous gene comprising the nucleic acid sequence of Claim 2.

14. The cell of claim 13, wherein the cell is a plant cell or a microorganism.

15. A plant transformed with a heterologous gene comprising the nucleic acid sequence of Claim 2.

16. A plant cell transformed with a heterologous gene comprising the nucleic acid sequence of Claim 2.

17. A plant seed transformed with a heterologous gene comprising the nucleic acid sequence of Claim 2.

18. A cell transformed with a heterologous gene comprising the nucleic acid sequence of Claim 3.

19. The cell of claim 18, wherein the cell is a plant cell or a microorganism.

20. A plant transformed with a heterologous gene comprising the nucleic acid sequence of Claim 3.

21. A plant cell transformed with a heterologous gene comprising the nucleic acid sequence of Claim 3.

22. A plant seed transformed with a heterologous gene comprising the nucleic acid sequence of Claim 4.